7

Doubt, Doubts, and Doubters: The Genesis of a New Research Agenda?

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7.1. INTRODUCTION

The first contingent valuation (CV) study was conducted in the early 1960s (Davis, 1963), a small number of studies were conducted in the 1970s (Hammack and Brown, 1974; Randall *et al.*, 1974; Brookshire *et al.*, 1976; Bishop and Heberlein, 1979), and the 1980s and 1990s have experienced an explosion of contingent valuation studies (Carson *et al.*, 1992). Doubters have not been reticent in expressing their concerns about CV. Early concerns were succinctly expressed by Scott when he characterized CV with the statement 'ask a hypothetical question and you will get a hypothetical response' 1965: 37.

   While research exploring the validity and reliability of CV estimates has evolved through a sometimes focused and sometimes random process over the last two decades, criticisms of CV have generally been sporadic, with the same doubts being rehashed over and over again. This evolution changed dramatically with the Exxon Valdez oil spill in 1989. No longer was CV an intellectual curiosity of practitioners or a tool of Government economists where the results of a cost–benefit analysis would only indirectly affect a broad segment of society. CV became the focal point in determining a liability payment by a single, but large, corporation, Exxon. Exxon brought a number of economists together to attack the credibility of CV, focusing on the measurement of non-use values to support their legal defence in the natural-resources damage litigation ensuing from the Exxon Valdez oil spill.[1] The focus of the critiques was on non-use values because this component of value was expected to be a large portion of any monetary damage claim put forward by the federal and state trustees responsible for protecting the damaged resources. After the case was settled out of court Exxon documented its major critiques of CV estimates of non-use values in a

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[1] The senior author of this paper, Boyle, worked for Exxon as a paid consultant in the natural-resource damage litigation arising from the Exxon Valdez oil spill.

184   KEVIN J. BOYLE, JOHN C. BERGSTROM

book edited by Hausman (1993) entitled *Contingent Valuation: A Critical Assessment*. Although the experiments presented in the Hausman book focused specifically on the application of CV to the measurement of non-use values, the doubts expressed were implicitly extended, perhaps not accidentally, to CV measurements of use values.

In response to this book, which many considered to express the jaded opinions of consultants to Exxon, the United States National Oceanic and Atmospheric Administration (NOAA) commissioned an independent 'Contingent Valuation Panel . . . to evaluate the use of [contingent valuation] . . . in determining nonuse values' (NOAA, 1993: 4610). The NOAA Panel concluded that CV estimates of non-use values do 'convey useful information' (ibid.) when their proposed guide-lines for conducting a CV study are followed. The outcome of the Exxon-funded critique and NOAA response clearly sent the message that conditions for conducting CV studies had changed. Doubters now had a solid foothold to express their doubts and supporters of CV were forced to recognize a well-organized and -financed attack on CV methodologies.

CV research, as a cohesive investigation, is incomplete and many hard questions remain. By focusing on these questions, rather than taking prematurely fast and firm positions, it may be possible to facilitate a more constructive debate. In the mean time, a healthy dose of concern is important in the application, use, and interpretation of CV. This is true for any empirical methodology, but doubts and scepticism are not sufficient to dismiss any analytical tool. The current debate helps to focus the issues of concern in the application of CV. In the remainder of this chapter we identify what we believe are some of the more important issues facing CV applications today. Before turning to these specific issues, we attempt to set the current debate over the validity of CV in a broader context.

7.2. A BROADER VIEW OF THE ISSUE OF CONCERN

The Hausman book is not the first assessment of the 'state of the art' of CV, and the NOAA Panel's report is not the first attempt to develop guide-lines for conducting CV studies. Cummings *et al.* (1986) did the first assessment of CV and proposed some very restrictive 'reference operating conditions' where CV was deemed to work well. The Cummings book, like the Hausman book, was denigrated by some critics but for the opposite reason. The US Environmental Protection Agency (EPA) provided funding for the assessment that led to the book and some viewed this as an attempt to deem CV as good enough for government work and to avoid additional funding of costly validation studies.

Fischoff and Furby proposed conditions for a 'satisfactory (CV) transaction' where respondents 'are fully informed, uncoerced, and able to identify

DOUBT, DOUBTS, AND DOUBTERS   185

their own best interests' (1988: 148). The Fischoff and Furby contribution has some credibility because they are generally deemed to be outsiders to the CV debate. They explicitly acknowledged the hypothetical nature of CV and asserted that 'specifying all relevant features and ensuring they have been understood, is essential to staging transactions. Unless a feature is specified explicitly and comprehensively, [CV respondents]...must guess' (ibid. 179–80). They go on to state that 'ensuring understanding is the responsibility of those who pose the transaction' (ibid. 180). At this juncture, Fischoff and Furby implicitly appear to be judging CV against an absolute criterion, establishing a satisfactory transaction. Two sides to this debate arise. A pragmatic approach would reveal that consumers do not have full information when making market decisions, so why should such an ideal be applied to CV applications? On the other hand, consumers can choose among the information when making market decisions, and we do not know what information they use, so we must provide as much information as possible. This position does not, however, recognize potential cognitive overload by respondents and the heuristics they may employ when answering CV questions in this context.

Despite the fact that three decades have elapsed since the publication of Scott's article, the basic critique of CV has changed little. Hausman states in the preface to his edited book that 'CV...differs significantly from most empirical research in economics, which is based on market data caused by real-world decisions made by consumers and firms' (1993: vii). The basic concern still centres around the hypothetical nature of CV; money is not actually exchanged. Although revealed behaviour results in the estimation of Marshallian surplus, which is not the desired Hicksian compensating or equivalent welfare measure (Mäler, 1974; Just et al., 1982; Freeman, 1993), the doubters are more confident in economic theory and econometrics to unravel Hicksian surplus than they are in individuals' statements of value. The doubters appear readily to accept the use of economic theory to establish Willig (1976) bounds or a combination of theory and econometrics to derive exact (Hicksian) welfare measures (McKenzie and Pearce, 1976; Hausman, 1981).

CV practitioners, on the other hand, have confidence that responses to hypothetical questions will approximate behaviour when money is actually exchanged, yielding acceptable estimates of Hicksian welfare. In the domain of use values a number of field and laboratory experiments lend credence to this confidence (Bishop et al., 1983; Dickie et al., 1987; Kealy et al., 1988). These comparisons of CV estimates with actual cash transactions are known as tests of criterion validity (Carmines and Zeller, 1979). No criterion validity studies exist to provide a comparable level of confidence in CV applications to the estimation of non-use values.

Fundamental problems exist with both the Hausman and NOAA Contingent Valuation Panel positions. The Hausman book and the NOAA

186   KEVIN J. BOYLE, JOHN C. BERGSTROM

Panel report do not clearly distinguish applications of CV to measuring use values from applications to measuring non-use values. There has been much more research conducted to investigate CV applications to use values than to non-use values (Cummings *et al.*, 1986; Mitchell and Carson, 1989; Carson *et al.*, 1992) and, consequently, there is less controversy surrounding the use of CV to measure use values. People who are unfamiliar, or casually familiar, with the CV debate have construed the Hausman book and NOAA Panel report to criticize all applications of CV, not just those to measuring non-use values. Both works, however, are concerned with potential problems associated with attempting to use CV for measuring non-use values. The issue of concern is also clouded by many CV studies estimating total values or option prices that include both use and non-use components.

Critiques in the Hausman book implicitly evaluate CV on an absolute scale where the outcome is either right or wrong, not in the context of errors involved in the application of other empirical methodologies. The NOAA Panel recognized this inconsistency when they deemed CV acceptable 'by the standards that seem to be implicit in similar contexts' (1993: 4610). For example, one line of criticism follows from the fact that CV estimates may be inconsistent with what is suggested by economic theory (Desvousges *et al.*, 1992; Diamond *et al.*, 1993). These inconsistencies also arise in the analysis of market data, but the conditions of economic theory (e.g., adding up, homogeneity, symmetry) are often imposed on the data to ensure estimates are consistent with theory (Deaton and Muellbauer, 1980). The Hausman critique also overlooks the fact that market data are collected by some type of survey and can be subject to some of the same concerns expressed regarding CV. The NOAA Panel position on CV standards is of concern because it proposed guide-lines that in many cases are without citations to document the recommended protocol and to place it in context with the literatures on economic welfare theory, survey research methodologies, existing valuation research, or comparable empirical analyses.

Within a research agenda, practical applications aside, objective rules must be employed to evaluate the credibility of any empirical methodology, and CV is no exception. The usefulness of a methodology for practical applications arises from the extent to which the methodology is capable of meeting a desired theoretical construct. In CV research, this is generally evaluated in terms of the validity and reliability of value estimates (Carmines and Zeller, 1979; Mitchell and Carson, 1989). Within this context, Fischoff and Furby proposed a conceptual framework for the conduct of CV studies, but they do not delve substantially into the context for accomplishing their proposals.

The NOAA Panel considered more of the details of accomplishing a CV study of non-use values. They addressed sample type and size, minimizing non-response, using personal interviews, pre-testing for interviewer effects,

reporting of sampling procedures, questionnaire pre-testing, conservative design, using willingness to pay, using referendum questions, accurate commodity descriptions, pre-testing photographs, reminders of substitutes, and various other issues (1993: 4611–14). Despite the prognostications of this esteemed group of economists, hard questions remain. For example, CV applications have typically employed mail surveys and the Panel did not discuss in detail why mail surveys are inappropriate and personal interviews are more appropriate. Referendum questions are simply dichotomous-choice questions with the payment vehicle posed as a referendum. Considering Fischoff and Furby's conceptual protocol, a referendum is not the right payment vehicle for all social contexts, i.e. respondents may know the decision or payment will be not be established by referendum vote. What if reminding respondents of substitutes does not affect value estimates? Does this mean that CV is fundamentally flawed because respondents do not consider substitutes when formulating value responses, or did the investigator specify the wrong set of substitutes, or do respondents consider substitutes without prompting? Thus, while helpful in raising questions for the CV research agenda, the NOAA Panel's recommendations also do not go far enough in answering the hard questions that must be addressed when designing a CV study.

In the ensuing discussion we focus on selected issues associated with applying CV which appear to us to be of greatest current concern in the literature. This is done within the context of the CV literature. Issues that affect CV values estimates, but are not unique to the method, such as the choice of a functional form in data analyses, will not be extensively discussed. The discussion is organized around value conceptualization, questionnaire design (information issues and CV methodology), and data analysis.

7.3. VALUE CONCEPTUALIZATION

Defining the value to be estimated is a necessary prerequisite of any valuation study regardless of whether CV, some other non-market valuation methodology, or market data are to be employed. Three issues rise to the forefront in CV studies: (1) understanding option price; (2) sorting out non-use values; and (3) the relationship between estimates of willingness to pay (WTP) and willingness-to-accept compensation (WTA). Option price and non-use values are interrelated because non-use values can be components of option prices. Option price and non-use values can also be measured as either WTP or WTA. Given that option price is the measure of an individual's value under conditions of uncertainty, this provides a useful starting-point for the discussion. The non-use value issue, however, is simmering close below the surface.

188   KEVIN J. BOYLE, JOHN C. BERGSTROM

7.3.1. Option Price

Let us start with a simple example where

$$V(p_{gw}, P_s, I; GW) \qquad (7.1)$$

is an indirect utility function representing an individual's optimal choices regarding consumption of groundwater; p_{gw} is the price of potable groundwater, P_s is a vector of prices of substitute sources of potable water, I is income, and GW is a vector of non-use arguments relating to groundwater quality. All other terms are suppressed for notational convenience. Let us assume that there are a variety of discrete threats to the groundwater resource and we wish to measure the value of reducing the probability of contamination. The appropriate measure of value is option price (Bishop, 1982; Smith, 1983; Freeman, 1993; Ready, 1993). Option price (op) can be defined by

$$\sum_i \pi_i' V(p_{gw,i}, P_s, I_i - op; GW_i) = \sum_i \pi_i V(P_{gw,i}, P_s, I_i; GW_i) \quad i = 1, \ldots, n$$

(7.2)

where π_i is the probability of alternative groundwater conditions, and $p_{gw,i}$, I_i, and GW_i are indexed by i to indicate that they may be influenced by the groundwater condition. The effects on p_{gw} and GW are obvious, while it is assumed that I (income) is net of health expenditures resulting from the consumption of contaminated groundwater. Option price (op) in this example, which assumes supply uncertainty and demand certainty, is a state-independent payment to reduce the probability of contamination. If π_j is the subset of probabilities associated with groundwater contamination, then $\pi_i' \leqslant \pi_i$ for at least one i.[2]

Three issues can be developed from this simple example. The first arises from a recognition that option price depends critically on the change in the probability of contamination. In the CV literature, practitioners have tended to overlook probabilities in the design of CV questions and in the analyses of CV data (Boyle and Bishop, 1987; Desvousges *et al.*, 1987; Loomis, 1987). Some notable exceptions do exist, including studies which attempt to incorporate the role of subjective probabilities into CV survey design and data analyses (Smith and Desvousges, 1987; Edwards, 1988; Loomis and duVair, 1993; Bergstrom and Dorfman, 1994). If option price is to be estimated, the CV question should be framed to include both the baseline (π_i') and alternative (π) probabilities. This information is subsequently utilized to analyse and interpret CV responses. This is particularly true for applications of dichotomous-choice questions where estimated

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[2] Option value is not considered here because it is simply the difference between option price and expected consumer surplus (Bishop, 1982). It is an artefact of uncertainty that does not arise from arguments in individuals' preferences.

equations, based on the value definition, provide the basis for deriving estimates of central tendency (Hanemann, 1984; Cameron, 1988; McConnell, 1990).

If information regarding the change in the likelihood of contamination is missing from the CV question, respondents guess at the current and future likelihoods of contamination, and there is no assurance that all respondents will impose the same assumptions (Lindell and Earle, 1983). When different respondents impose different assumptions, then CV responses can only be assumed to be loosely associated with the desired policy value and aggregating individual CV responses may be akin to adding apples and oranges, whereas under the best of conditions, perhaps, the problem may be no worse than aggregating different varieties of apples. The absence of probability information appears to be an act of accidental omission in many cases. In some cases, however, CV exercises are not well-linked to physical changes that are occurring in the resource. In the case of groundwater contamination, CV studies have been hindered by the absence of dose-response models that reveal how the policy being valued will affect groundwater contamination (Boyle *et al.*, 1994). Thus, physical scientists may not be providing all of the information needed to effectively apply CV value estimates to assess specific environmental policy and management actions.

The second issue also relates to uncertainty—even if information on the likelihood of contamination is provided in a CV question, respondents may reject this information in favour of their own subjective perceptions of contamination. In a classic study, Lichtenstein *et al.* (1978) demonstrate that people tend to overestimate the likelihood of low-probability events and underestimate the likelihood of higher-probability events (see also Kask and Maani, 1992). If this is the case, providing information on the likelihood of contamination in the CV question may not be sufficient; it may also be necessary to elicit respondents' subjective perceptions of the likelihood of contamination in the survey. Doing this, however, opens other potentially undesirable doors. Should subjective probabilities be elicited prior or subsequent to the CV question? The former can be used as exogenous regressors, but may not represent those used in answering the CV question if important information is contained in the question itself. Subjective probabilities elicited immediately subsequent to the CV question may be more representative of the information respondents used in answering the CV question, but this data is endogenous to the valuation exercise. These issues have not been explored in the CV literature, and if they have been explored by social psychologists in other contexts, this literature has not been brought to bear on CV. If respondents employ subjective probabilities when answering CV questions, the resulting value estimates are only appropriate for valuing a policy that actually reduces the probability of contamination, for example, by the proportion that respondents subjectively employ. Different

190   KEVIN J. BOYLE, JOHN C. BERGSTROM

respondents may employ different subjective probabilities, further complicating the interpretation of CV data unless this issue is explicitly addressed in the analysis.

Another implication of subjective editing is that CV studies which attempt to measure values under certainty may actually be measuring values under uncertainty—that is, option price. For example, many CV studies are framed to estimate values under conditions of supply certainty. However, the description of potential effects of a proposed policy in a CV question may not be clear to respondents or respondents may not believe that the outcome of the policy will occur with certainty. The consequence is that respondents may edit the information presented, transforming the CV exercise to valuation under uncertainty. Even if supply is certain and the CV description is completely clear, respondents may be providing option prices if their demand is uncertain. Thus, changes in probabilities, whether objective or subjective, are fundamental to CV studies and the ramifications of this theme are relatively unexplored in the CV literature.

The third issue relates to the components of option price. Since option price can be interpreted as economic value under uncertainty (Randall, 1991), it can include both use and non-use values as components. An ongoing debate among researchers and decision-makers is the relative importance of these two component values while the interrelationship of these components remains unknown (Fisher and Raucher, 1984). For example, are use and non-use values complementary or substitutes?

The bottom line is that although option price is perhaps the most widely estimated value in the CV literature, this value is generally treated as a black box, without concern for the component parts. Such benign neglect may be acceptable in a policy context where option price is the desired welfare measure, but this state of affairs is simply unacceptable from a research perspective when considering the validity and reliability of CV estimates.

7.3.2.   Non-Use Values

This is not the place to debate the validity of non-use values and their relevance for public policy (Kopp, 1992); rather, non-use values are accepted for this discussion and the estimation of these values is considered (Bishop and Welsh, 1992; Carson *et al.*, Chapter 4 of this volume). We consider here two main areas of investigation in the literature: alternative CV approaches for measuring non-use values and explorations of revealed-preference techniques for measuring non-use values.

With respect to CV approaches for measuring non-use values, one line of research starts with the estimation of option price, or total value under conditions of certainty, and then estimates non-use values conditioned on the absence of any use opportunities (Boyle and Bishop, 1987). An altern-

ative approach asks respondents for total values and to allocate their responses to a menu of component values, which includes several types of non-use value 'motivations' (altruism, bequest, etc.) (Walsh *et al.*, 1984; Loomis, 1987). The debate over these two approaches has been going on for over a decade without any resolution, or any solid research to support either position.

The former approach has the advantage that non-use values are conditioned on a specific set of circumstances—but is this set of circumstances correct for the policy question at hand? If embedding does occur as suggested by Kahneman and Knetsch (1992), then this approach may reduce the potential for respondents to provide responses composed of use and non-use values when only non-use values are requested. If use and non-use values are complementary, then non-use values are overestimated if use truly would not be precluded. The converse occurs if they are substitutes. Conditioning non-use values on the absence of use values would be irrelevant if these component values are neither complements nor substitutes.

The menu approach avoids having non-use values conditioned on the absence of use values, but has a comparable drawback. Unless value components each arise from weakly separable components of individuals' preferences, the component values will not be additive. If preferences for component values are not separable, estimates for individual components are conditioned on the sequence in which the researcher designs the menu of responses. In addition, questions arise regarding whether the components of the non-use menu are appropriate or whether respondents are answering the valuation question in the only way possible given the framing of the response options.

In a recent article, Larson (1993) challenges the conventional wisdom that CV is the only game in town when it comes to measuring non-use values, and develops a conceptual framework for revealed-preference measures of non-use values. For opponents of CV this makes the method obsolete whereas for proponents it provides an empirical testing-ground for validation of non-use value measures. Larson's conceptual framework draws upon such activities as money and time committed to environmental NGOs as revealed-behaviour linkages to non-use values. While these activities are likely indicators of non-use values, they may also contain a use component which is difficult to separate out from the non-use component. Environmental-NGO members, for example, may receive publications to read and other services which contribute to use values (Portney, 1994). In addition, individuals holding non-use values who have not demonstrated any choice-based behaviour are omitted.

Another more general problem exists in much of the non-use value literature—non-use values are not well understood and defined. Misunderstandings begin with the label ('non-use', 'existence', 'bequest', and 'passive use') and carry through to empirical estimates. All that appears to be clearly

192   KEVIN J. BOYLE, JOHN C. BERGSTROM

known is that non-use values do not *require* any revealed-preference beha-
viour or direct interaction with the environmental resource. Beyond this
point the waters become murky rather quickly, precluding progress regard-
ing the validation of economic estimates of non-use values using CV or some
other technique. Since explorations of alternatives to CV for measuring non-
use values are in their infancy, the spotlight has been on CV as the sole
technique for measuring non-use values. Issues surrounding the definition,
measurement, and application of non-use values, however, are much larger
than concerns one might have about CV as an economic valuation tech-
nique, but at this time the two (CV and non-use values) appear to be
systemically rather than fraternally connected.

7.3.3.   WTP and WTA Disparity

The CV literature has a number of studies demonstrating substantial empir-
ical differences between WTP and WTA (Bishop *et al.*, 1983; Knetsch and
Sinden, 1984; Brookshire and Coursey, 1987; Coursey *et al.*, 1987). Eco-
nomic theory suggests that the difference between WTP and WTA should be
small if income effects are small (Just *et al.*, 1982; Freeman, 1993) or close
substitutes exist for the commodity being valued (Hanemann, 1991). How-
ever, even when these conditions appear to be met in empirical studies,
unreasonably large disparities between WTP and WTA have been observed.
Kahneman and Tversky (1984) use 'prospect theory' to suggest that the large
disparities between WTP and WTA might be explained by respondents
shifting reference points when valuing gains and losses of equal magnitudes.
At this point, however, the disparity between WTP and WTA observed in
empirical CV studies remains an enigma. Problems with adequately explain-
ing observed disparities between WTP and WTA, and unrealistically large
estimates of WTP relative to WTA, prompted the NOAA Panel to recom-
mend the use of WTP.

In many natural resource and environmental situations, WTA is the
theoretically correct welfare measure (Vatn and Bromley, 1994). This
includes situations, for example, where an individual may suffer the loss of
use of a natural resource over which they hold initial rights. In such a case,
the correct Hicksian welfare measure is the minimum compensation it would
take to bring the individual back up to his or her pre-loss utility level (Just
et al., 1982; Freeman, 1993). Because of the theoretical relevance of WTA
under certain property-right structures, it seems inconsistent simultaneously
to advocate the use of CV and exclude applications to WTA. For example,
Coursey *et al.* (1987) found that WTP is stable in repeated trials, while WTA
declines over repeated trials and asymptotically approaches WTP. These
experimental results, although not directly transferable to CV applications,
do suggest possible means for reducing the disparity between WTP and
WTA in CV surveys.

DOUBT, DOUBTS, AND DOUBTERS   193

7.4.   ELICITATION AND ANALYSIS OF CV RESPONSES

In this section we first discuss issues surrounding the question format used to elicit CV responses. Implicit in the Fischoff and Furby article is the recognition that the design of CV questions for eliciting values contains two different, but related, components. The first is the description of the commodity to be valued (commodity description) and the second is the description of the institutional setting for valuing the commodity (contingent market). Neither component stands alone, but each raises separate issues to be considered.

7.4.1.   Commodity Description

The commodity description constitutes the bridge between the theoretical definition of value and respondents' value responses. As such, this is the crucial component of any CV study, because it tells respondents what they are buying and flaws in this information can undermine the entire valuation exercise. The concerns here can be succinctly expressed with three questions. What information do respondents need to answer CV questions? What information unduly influences CV responses, i.e. leads respondents to understate or overstate their values? And is it possible to create information overload by providing respondents with an overly detailed commodity description?

Referring back to the groundwater option price in Equation (7.2), the commodity description would detail the contaminants and the effects of contamination. The baseline likelihood of contamination would be presented along with its proposed change. The availability and cost of substitute sources of potable water would also be provided, as advocated by the NOAA Panel. This collective information is what Fischoff and Furby refer to as the 'good'. They state that 'achieving...clarity in [the commodity description]...is a craft, but one that can be aided by the scientific study of potential pitfalls' and 'has been part of the research methodology of every social science that asks people to answer unfamiliar questions' (1988: 154). A number of studies have found the addition or deletion of information in commodity descriptions can have statistically significant effects on CV responses (Bergstrom and Stoll, 1989; Bergstrom *et al.*, 1989, 1990; Boyle, 1989; Poe, 1993; Munro and Hanley, Chapter 9 of this volume), highlighting the need to investigate appropriate commodity descriptions.

Bergstrom *et al.* (1990) group information used to describe an environmental commodity under two broad headings, characteristic and service information. Characteristic information describes the objective physical attributes of an environmental commodity (e.g. groundwater quantity and quality). Service information describes how changes in commodity characteristics affect use and non-use service flows (e.g. drinking-water services and

194   KEVIN J. BOYLE, JOHN C. BERGSTROM

existence value of clean aquifers). This may be less important for the estima-
tion of use than non-use values because users may be relatively more familiar
with the implications of a change in the resource. If users have not experi-
enced the proposed condition of the resource, service information may still
be of primary importance when individuals are answering CV questions
designed to elicit use values (Boyle *et al.*, 1993).

Identifying appropriate types and amounts of characteristic and service
information to describe an environmental commodity adequately is a diffi-
cult task. Additionally, relevant information is not limited to that regarding
the characteristics and services of the environmental commodity *per se*. The
NOAA Panel, for example, stresses the need to include substitute informa-
tion in a CV survey. But the literature is not clear as to how much substitute
information is 'enough'. In a meta-analysis of CV studies of groundwater
value (Boyle *et al.*, 1994), information regarding the cost of substitutes
significantly reduced WTP responses while information about substitute
availability did not. Cummings *et al.* (1994) have also shown that the provi-
sion of information on substitutes can influence values in a laboratory
setting. Considering the research agenda, particularly in the context of
field experiments, addressing substitutes is not easy. If CV estimates are
not statistically sensitive to information on substitutes, a number of plaus-
ible explanations arise: respondents neglected to consider substitutes so the
CV estimates are flawed, likely overestimating the true value; the investiga-
tor provided the wrong set of substitutes so the study design is flawed; or
respondents were already considering substitutes so the provision of this
information in the CV experiment was redundant.[3]

The NOAA Panel proposed a 'burden of proof' test where, in the absence
'of reliable reference surveys,... pretesting and other experiments', practi-
tioners must show that each CV 'survey does not suffer from the problems
that their guidelines are intended to avoid' (1993: 4614). As the example in
the preceding paragraph illustrates, the burden of proof can constitute a
formidable obstacle. Statistical results, whether from a CV study or a study
using market data, can be subject to multiple interpretations and identifying
appropriate conclusions can often be difficult at best. The correct set of
substitutes may vary across goods and sample populations, making it
difficult to establish a set of reference surveys. These concerns are not
unique to substitutes, but may be pervasive throughout commodity descrip-
tions.

Ferreting out an appropriate commodity description has generally been
based on the issue to be valued, discussions with individuals knowledgeable
with the valuation issue, the theoretical definition of value, previous studies
of similar topics, and the investigators' experience. This is where the 'craft'

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[3] It is assumed that the CV experiment would have a design where respondents would
be randomly stratified into those who do, and those who do not, receive information on
substitutes.

that Fischoff and Furby discuss plays a crucial role in the design process. Refining the survey instrument typically involves the use of focus groups, one-on-one pre-tests, and more recently verbal protocols allowing the survey instrument to be tailored to the specific application (Desvousges *et al.*, 1992; McClelland *et al.*, 1993).

One criticism of such an individualized, interactive approach to survey design is that information provision may become endogenous to the survey process. How does this repeated interaction affect the researchers' perceptions of the valuation problem (e.g. does the nature of the commodity to be valued change)? Furthermore, the iterative nature of such an approach invites the CV researchers to decide, on an *ad hoc* basis, to add or drop information based on insights gained from focus groups, pre-tests, etc. If statistical tests are not conducted to investigate the effects of adding or deleting information, how do we know what the final effects of such changes will be on CV responses?

Simply put, we do not know what information respondents need, so information provision often appears to be a hit-or-miss attempt to provide accurate and complete information, perhaps subject to the whims of individual investigators. In addition, commodity descriptions are often constrained by the availability of technical details regarding proposed changes in provision. Progress demands a systematic research programme to identify and classify the specific types of information respondents commonly use when answering CV questions and how this varies across applications and/or respondents. Furthermore, such a research process must be conducted in an interdisciplinary context to improve the technical information that often constitutes the basis of commodity descriptions.

7.4.2.   Contingent Market or Referendum Description

Four issues are explored in this subsection: (1) choice of CV question format; (2) selection of a payment vehicle; (3) treatment of zero, protest, and misstated bids; and (4) mode of data collection. The NOAA Panel's recommendation of referendum questions provides an underlying linkage of these topics. Referendum questions are dichotomous-choice questions with the payment vehicle posed as a referendum vote.

7.4.2.1.   *Dichotomous-Choice Questions*

A number of different formats have been used to frame CV questions, with dichotomous-choice, open-ended, and unanchored payment cards being most commonly employed in the literature today (for more discussion of CV question formats, see Langford and Bateman, Chapter 12 of this volume). The most important questions, however, centre on dichotomous-choice (DC) questions. A generic DC question, given a commodity description and appropriate payment vehicle, might be posed as:

196   KEVIN J. BOYLE, JOHN C. BERGSTROM

> Would you pay $—— per year to reduce groundwater contamination so drinking water meets US Environmental Protection Agency safety standards?

The blank is filled in with a randomly assigned monetary amount (Cooper, 1993). This question can be modified to a referendum format:

> Would you vote 'yes' on a referendum to reduce groundwater contamination so drinking water meets US Environmental Protection Agency safety standards and your personal cost would be $——?

The referendum format has been advocated by Hoehn and Randall (1987) using incentive-compatibility arguments. The referendum format is not universally applicable. Mitchell and Carson (1989) have argued that payment vehicles must be believable and neutral in the elicitation of values. The referendum framing of DC questions is not likely to satisfy the believability condition in the elicitation of many use values because referenda are not typically used to make money from these decisions. Thus, although DC questions are universally applicable, the referendum format is only applicable in narrower contexts.

The primary concern with DC questions is whether the monetary amount provides a value clue, thereby inadvertently affecting responses. Cooper and Loomis (1992) provide tentative evidence of these effects, and Shapiro (1968) has shown that this type of anchoring can arise even with the amount individuals pay for market goods. These effects can occur for traditional DC questions or for DC questions posed as a referendum, and may be more pronounced with multiple-bounded DC questions (McFadden, 1994). If the tentative evidence on anchoring proves to true, will DC maintain its current status as the fair-haired CV question format?

The anchoring concern in DC questions, however, is a prime example of the issue of relative errors discussed in the Introduction. If posting a price for a market good can influence what consumers will pay for a market good, this influence would be reflected in Marshallian estimates of consumer surplus. Is the anchoring effect in DC questions any worse than for market goods with posted prices? Within this context, a statistically significant anchoring effect is not sufficient to dismiss DC questions, but it is necessary to assess the extent of this impact relative to any similar effect in revealed-behaviour measures. Future research on CV questions should focus on the selection and effect of monetary amounts in DC questions, and the relative errors of value estimates derived from DC questions versus competing question formats (open-ended and unanchored payment cards).

7.4.2.2.   Payment Vehicle

Despite early evidence that payment vehicles can influence responses to CV questions (Rowe and Chestnut, 1983; Mitchell and Carson, 1985) no pub-

lished research has been conducted to address this concern. The guiding principle has been the Mitchell and Carson (1989) believability and neutrality conditions, and with the extensive use of DC questions, the Hoehn and Randall (1987) incentive-compatibility argument is often invoked. In reality, payment vehicles are generally customized to each study and are refined in survey pre-testing, with no checks for undesirable effects of the payment vehicle on value estimates. The selection of payment vehicles would not pass the NOAA Panel's 'burden of proof' test of content validity (Carmines and Zeller, 1979), leaving a large hole in the CV literature.

Even DC questions posed as referenda are not without problems. The first is that 'DC' and 'referendum' are often used as synonyms to describe CV questions eliciting a yes/no response to a fixed monetary amount. This confusion has led some investigators to pose DC questions that do not use a referendum, while appealing to the Hoehn and Randall incentive-compatibility argument. As noted above, the referendum format does not always pass the Mitchell and Carson believability condition for some applications of DC questions. Finally, and most important, the institutional context of CV requires that respondents know how the payments will be collected. The referendum format must include an explanation of how the payments will be collected, e.g. per household fee on water bills, property taxes, income tax, etc. This brings us full circle to the conditions where payment vehicle effects were initially identified. The referendum format of DC questions may have desirable incentive properties for eliciting values, but the inclusion of a payment mechanism may have concurrent undesirable effects. The effects of payment vehicles simply can not continue to be overlooked from either a conceptual nor an empirical perspective.

7.4.3.3.   *Zero, Protest, and Misstated Responses*

These are not issues that have been neglected in the CV literature, but they are far from being resolved. Given the discussion above, the initial focus here is with DC questions. 'No' responses to DC questions are generally probed for invalid responses, searching for free-riders, individuals protesting about the payment vehicle, etc. If the data are to be screened for invalid responses, 'yes' responses must also be examined, for example, to identify individuals who support the project behaving strategically. Beyond this consistency in the treatment of the data, no established theoretical criteria or generally accepted protocols exist for excluding observations from data analyses. It appears that a consensus exists that some observations may be invalid, but the exclusion of observations is generally undertaken using *ad hoc* criteria.

The NOAA Panel recommended allowing respondents the option of answering 'do not know' in addition to 'yes'/'no' when answering DC questions. An additional issue relates to individuals who do not value the good. Individuals who answer 'no', but hold a positive value, are treated the same as individuals who answer 'no' and hold a value of $0. Consideration of

198   KEVIN J. BOYLE, JOHN C. BERGSTROM

response distributions to other question formats, such as open-ended questions, suggests that a discrete spike might occur at $0 in the distribution of values. Perhaps individuals who answer 'no' to a DC question should be given the opportunity to answer '$0' and these responses should be modelled in the data analyses.

Concerns regarding data screening also apply to open-ended, unanchored payment cards, and other questioning formats. Open-ended questions typically result in zero bids and these bids are screened for protests and other types of invalid responses. Non-zero bids are also sometimes screened for invalid responses (e.g. a bid representing 25 per cent or more of someone's income might be interpreted as unreasonable or an error). Some investigators have used statistical routines to search for data outliers (Desvousges et al., 1987). The fundamental concern remains; no established theoretical criteria or established protocols exist for excluding responses. Although the issue of zero values does not arise with most other question formats because an answer of '$0' is allowed, the NOAA Panel's concern of allowing 'do not know' responses applies to all questioning formats.

The issue of screening CV data for invalid responses cuts to the heart of the critique that CV is not based on actual consumers' actual market decisions (Diamond and Hausman, 1994). CV practitioners, by screening CV data, implicitly acknowledge that there is some merit to this critique (Stevens et al., 1994). The implicit agreement does not extend beyond this initial acknowledgement. Critics appear to be arguing that the absence of cash transactions makes all CV responses flawed or that the share of invalid responses in the data makes it useless for statistical analyses. CV practitioners appear to believe that the share of individuals providing invalid CV responses is small and these responses can be identified and addressed in data analyses. This process is not easy. Why would someone who is behaving strategically reveal this motive to an interviewer? If direct revelation of ulterior motives is not possible, is there an objective way to identify strategic responses?

These concerns also apply to accidental misstatements of value when, for example, a respondent does not fully understand the valuation task. Respondents' misunderstandings of CV scenarios, from either incomplete or unclear commodity descriptions, may be the key reason for the embedding problem, which is on the 'front burner' in the current debate over the application of CV to measuring non-use values (Diamond and Hausman, 1994; Hanemann, 1994).

It is not an easy task to establish conditions for excluding responses from CV data. A profitable line of investigation, perhaps, involves identifying groups of individuals who are likely to misstate their values either purposely or inadvertently. The focus would be on whether responses by these individuals significantly influence estimated statistics. This is not substantially different to what some investigators have done when they use the data with

and without invalid responses, but the investigations could be more focused in terms of economic theory and more rigorous in terms of statistical analyses. Researchers should investigate the appropriateness of the NOAA Panel's 'do not know' recommendation. This issue was already being invest- igated prior to the NOAA recommendation (Ready *et al.*, 1995). Zero- bidders in DC data also need to be investigated, as do other influential observations such as 'outliers' (Mitchell and Carson, 1989).

As a matter of perspective, it is important to recognize that screening of data occurs in all empirical analyses, even market data. For example, the US Department of Agriculture's Market News Service collects data on the sale prices and volumes of agricultural commodities. Data reported by sellers and buyers that is deemed to be misstated in an attempt to influence market conditions is excluded from reported market statistics.[4] The exclusion deci- sion is made by the individual who collects the market data and the indi- vidual's superior; no explicit theory or econometric analyses are used as a basis for exclusion. Some valid data may be excluded and some invalid data may be included. It is also important to recognize that individuals operating in wholesale markets might have more knowledge, ability, and incentives to influence survey outcomes than do respondents to CV surveys. Market data, like CV data, are often collected in a survey format, with all of the associated data-collection problems and with a greater likelihood of respondents behaving strategically. Again, we are back to the issue of relative errors.

7.4.3.4.   *Mode of Data Collection*

The NOAA Panel's recommendation of personal interviews, and its state- ment that they believe that it is unlikely that reliable estimates of values could be elicited with mail surveys' (1993: 4608), hit a raw nerve among CV researchers and survey researchers who work with mail surveys. This is an example where a strong position has been taken without adequate reference to the literature. What is known in the literature on personal interviews and mail surveys that supports the NOAA Panel's position? Using personal interviewers allows an investigator more control over respondents' CV responses, but also introduces a potential interviewer effect. How should these countervailing effects be considered?

The vast majority of CV studies have been conducted using mail surveys because the per-observation cost is less than that of personal interview surveys and most university researchers do not have access to trained inter- viewers. These pragmatic considerations, however, are not sufficient to justify the extensive use of mail surveys; it must be demonstrated that mail surveys are capable of providing valid and reliable CV estimates. There are only a few studies in the literature that investigate alternative

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[4] This information was received from Mr John Boyle (Kevin Boyle's father), who is a former employee of the Market New Service.

200   KEVIN J. BOYLE, JOHN C. BERGSTROM

CV administrative modes, and these studies produce mixed or inconclusive results (Randall and Kriesel, 1990; Mannesto and Loomis, 1991; Loomis and King, 1994). Because of the dearth of research investigating the relative merits of different modes of administrating CV surveys, we believe this issue deserves high priority on the CV research agenda. With personal interviews being the most expensive form of primary-data collection, the benefits of establishing mail surveys as a credible mode for conducting CV surveys can be substantial.

7.4.4.   Analysis of CV Responses

Many contributions have been made to the CV literature in recent years in terms of analysing DC data (Cameron, 1988), functional form of valuation equations (Boyle, 1990), developing bid amounts for DC questions (Cooper, 1993), computing confidence intervals for DC means (Park *et al.*, 1991)—and the list goes on and on. Looking at the future research agenda, contributions in this area might be reaching diminishing returns. Sophisticated econometric models are intended primarily to recover information from poor data. Many of the recent contributions to the CV literature accept the quality of whatever data is available and concentrate on new econometric twists to develop what may be questionable insights. However, the greatest future pay-offs may lie in two areas: (1) better understanding of individual preferences for environmental commodities, with insights from a wide variety of disciplines including economics, psychology, marketing, and philosophy (Portney, 1994), and (2) improving CV data-collection efforts to enable clearer and more robust insights from empirical analyses of these data.

7.5.   CONCLUSIONS

The title of this chapter was posed as a question, so it is only appropriate to answer the question. The answer is implicit in the arguments presented within the chapter. The current debate surrounding CV has changed the rules of the game, suggesting the need for a more focused research agenda and improved study designs leading to clearer insights. This conclusion is emphasized by the NOAA Panel's 'burden of proof' condition. Rather than CV being innocent until proven guilty, the lasting impact of the Panel may be their judgement that CV estimates are guilty until proven innocent. Although the context for their pronouncement dealt with CV applications to non-use values in natural-resource damage litigation, it is clear that their guide-lines are being generally applied to all applications of CV. The loosely evolving nature of CV research and the lack of a revealed-preference connection for non-use values made the application of CV to the measurement of non-use values susceptible to criticism.

The basic argument against CV, that transactions involving cash do not occur, comes very close to rejecting the sovereignty of consumer demand in suggesting that consumers cannot decide what is in their best interest unless money changes hands. This seems to be a relatively strict and arbitrary condition. In fact, if CV did not exist, Exxon would have looked for another weak link to reduce their potential liability payment, even if the only opportunities were revealed-preference measurements. Thus, the issue that brought CV to its current contentious position might have focused on a revealed-preference measure within another context.

Hard-and-fast positions on any issue appear to shut off the research agenda prematurely. Research is about asking hard questions and subjecting these questions to objective and rigorous study. Researchers are trained to raise doubts and act as if we were all from Missouri—that is, before we reject or accept something as 'fact', we say, 'Show me!' A healthy dose of scepticism is important in the application, use, and interpretation of any empirical methodology. However, any empirical methodology, whether it deals with estimating economic values or testing an accused criminal's DNA, cannot be rejected out of hand by unsubstantiated doubt and scepticism.

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202   KEVIN J. BOYLE, JOHN C. BERGSTROM

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DOUBT, DOUBTS, AND DOUBTERS   203

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206   KEVIN J. BOYLE, JOHN C. BERGSTROM

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